

## LUCAS MAGNET QUENCH PROCEDURES TO SAVE A HUMAN LIFE

The only time a magnet is quenched is in a **life-threatening situation**:

A person is pinned against the magnet by a large metal object resulting in **life-threatening injuries** and cannot escape.

If a human is pinned against the magnet but **has not experienced life-threatening injuries, DO NOT QUENCH THE MAGNET** – CALL THE LUCAS CONTACTS (Karla, Kevin, Mehdi or Gary)

To quench a magnet, press the red run-down button at the quench box located in each magnet suite.

All other persons must evacuate the magnet room **before** the quench is initiated.

Quench boxes are all located in the magnet room except for the 7T suite in which it is located in the control room on the wall to the left of the magnet room door.

If a helium cloud forms in the magnet room as a result of the quench, do the following:

- 1 - Turn on the switch for the emergency exhaust fan for ventilation in the magnet room – exhaust fan switches are located inside the magnet room and outside. (see attached pictures)
- 2 - If the helium cloud is not properly vented outside of the room by the exhaust fan, prop open the magnet room door and all other doors leading to outside of the building that will vent the helium cloud.
- 3 - One person must be positioned outside of the building to redirect any pedestrians around the helium cloud.
- 4 - Contact the Lucas contacts as posted in magnet suite control room (Karla, Kevin, Mehdi, or Gary)

Lucas Quench Boxes

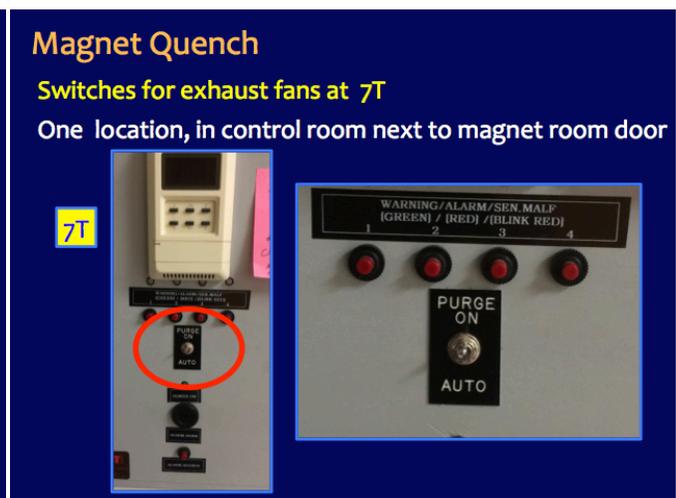


## SPONTANEOUS MAGNET QUENCH EMERGENCY PROCEDURES

In the event of a spontaneous quench of a magnet, the magnet room may fill with a cloud of helium gas.

If so, quickly follow these directions:

- 1 - Evacuate the patient from the magnet and magnet room as quickly as possible.
- 2 - If a helium cloud forms in the magnet room as a result of the quench, do the following:
  - a - Turn on the switch for the emergency exhaust fan for ventilation in the magnet room – exhaust fan switches are located inside the magnet room and outside (see attached pictures).
  - b - If the helium cloud is not properly vented outside of the room by the exhaust fan, prop open the magnet room door and all other doors leading to outside of the building that will vent the helium cloud.
  - c - One person must be positioned outside of the building to redirect any pedestrians around the helium cloud.
- 3 - Contact the Lucas contacts as posted in magnet suite control room (Karla, Kevin, Mehdi or Gary)



## **SUPERCONDUCTIVE MAGNETS AND LOSS OF THE MAGNETIC FIELD (QUENCH)**

Superconducting MR magnets contain a large solenoid coil of superconducting wire in a closed loop.

The wire is superconducting (i.e. passes current without resistance) only when cryogenically cooled by liquid helium.

Superconductive magnet coils are submerged in liquid helium at 4.17 degrees Kelvin (-269 °C) in a vessel called a cryostat.

During installation, the superconductive coil is cooled below its critical point and a current is introduced by way of an external power supply until the specified magnetic field is reached.

Once a superconducting magnet is ramped up and fully magnetized, it takes no additional current or power to keep the magnet at field.

A superconducting switch is then closed forming a closed loop through which current perpetually flows without the need for an external power supply.

Although there is no resistance in a superconductive magnet coil when properly cooled and energized, there is a great deal of energy stored in the electric current.

Should any part of the wire increase in temperature beyond its critical point, the magnet will quench and the magnetic field will be lost.

During a quench, the wire becomes resistive and therefore generates heat.

The heat boils off the liquid helium very quickly entering a gaseous state.

It will also undergo a marked increase in volume as the gas/liquid volume ratio for helium is approximately 760 to 1.

This is expensive (loss of helium and loss of magnet time) and may result in a possible risk to patients and staff working near the magnet if the helium gas is not properly vented to the outside of the building and enters the magnet room.

The risks include:

- Noise (gaseous helium exiting the cryostat)
- Frostbite (if liquid helium contacts skin)
- Asphyxiation (if the helium gas enters the magnet room due to a breakdown in the vent, it will displace the air/oxygen).
- Loss of helium gas into the magnet room will generate an increased pressure, possibly preventing an in-swinging magnet room door from being opened.

Please see Spontaneous Quench Procedures and Magnet Quench Procedures for additional information.